GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Thermodynamics, PG_00055287		
Field of study	Transport and Logistics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Damian Bocheński	
	Teachers	dr hab. inż. Damian Bocheński dr inż. Piotr Bzura dr inż. Patrycja Puzdrowska	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	60	10.0	80.0	150

Subject objectives	acquaint with the basic concepts of classical thermodynamics, laws of thermodynamics, properties of thermodynamic substances, energy and exergy balances for thermodynamic systems, ideal cycles of thermal machines, and explain the importance of lecture subjects in engineering practice

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K01] is aware of the need of constant improvement within the range of the possessed job and knows the possibilities of further education	Student applies knowledge of thermodynamics to solve technical problems. Recognizes the basic concepts of the terminology used in thermodynamics. It describes the properties of thermodynamic systems using zero and first and second laws of thermodynamics. Shows the energy metabolism in the system work and entropic systems. Specifies balances: mass, energy and exergy. Presents the ideal gas law and describes the properties of the energy of combustion engines, gym, steam, refrigeration and heat pumps with respect to their theoretical circuits. Analyzes the properties of the energy produced steam and describe the properties of solids and liquid, which are essential in engineering practice.	[SK2] Assessment of progress of work
[K6_W03] has a basic knowledge on hydromechanics, thermodynamics, machine construction, ecology, materials science and electronics necessary to understand the construction and operation principles of means of marine transport	Student applies knowledge of thermodynamics to solve technical problems. Recognizes the basic concepts of the terminology used in thermodynamics. It describes the properties of thermodynamic systems using zero and first and second laws of thermodynamics. Shows the energy metabolism in the system work and entropic systems. Specifies balances: mass, energy and exergy. Presents the ideal gas law and describes the properties of the energy of combustion engines, gym, steam, refrigeration and heat pumps with respect to their theoretical circuits. Analyzes the properties of the energy produced steam and describe the properties of solids and liquid, which are essential in engineering practice.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE Introduction. Fundamentals of thermodynamics. The zeroth law of thermodynamics. The principle of conservation of amount of substances. The first law of thermodynamics. Energy balance. Equations of ideal, semi-ideal and real states. Entropy. Changes in ideal gases. The second law of thermodynamics. Theoretical cycles in internal combustion piston engines. Theoretical cycles in internal combustion turbine engines. Thermodynamics of solids and fluids. Thermodynamics of steams. Theoretical cycles in steam power plant. Theoretical cooling cycles and heat pumps.

Prerequisites and co-requisites

Subject knowledge of Physics, Fluid Mechanics, Mathematics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
colloquium on exercises	60.0%	25.0%
completion of laboratory exercises	100.0%	25.0%
colloquium from the lecture	60.0%	50.0%

Recommended reading

Basic literature	Pudlik W.: Termodynamika. Wyd. PG, Gdańsk 1995. 2. Szargut J.: Termodynamika. PWN, Warszawa 1980. 3. Szargut J.: Termodynamika techniczna. PWN, Warszawa 1991. 4. Szargut J.: Termodynamika techniczna. PWN, Warszawa 1998. 5. Wiśniewski S.: Termodynamika techniczna. WNT, Warszawa 1980. 6. Wiśniewski S.: Termodynamika techniczna. WNT, Warszawa 1999. 7. Wiśniewski S., Wiśniewski T.S.:: Wymiana ciepła. WNT, Warszawa 1994. 8. Pudlik W., Grudziński D., Cieśliński J., Jasiński, W.: Termodynamika zadania i przykłady obliczeniowe. Gdańsk 2008
Supplementary literature	Buchowski H, Ufnalski W.: Podstawy termodynamiki, WNT, Warszawa 1998. 2. Domański R., Jaworowski M., Redow M., Kołdyś J.: Wybrane zagadnienia z termodynamiki w ujęciu komputerowym. PWN, Warszawa 2000. 3. Staniszewski B.: Termodynamika. PWN, Warszawa 1982.

	eResources addresses	Adresy na platformie eNauczanie: Termodynamika - Moodle ID: 25711 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25711 Termodynamika - Moodle ID: 25711 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25711 Termodynamika - Moodle ID: 25711 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25711 Termodynamika - Moodle ID: 25711 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25711 Termodynamika - Moodle ID: 25711 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25711
Example issues/ example questions/ tasks being completed	1.Present the First Law of Thermodynamics in descriptive and analytical terms, 2. Describe the entropy of solids and liquids, 3. Draw a simple Joule cycle diagram and show graphs of such a cycle in "T-s" and "i-s" systems, and determine the formula for its efficiency, 4. Prove that the work performed by a piston machine in isothermal transformations is not equal for the same piston displacement, 5. Draw a heat graph for water, excluding heat of its pushing, and mark on it the heat	
Work placement	Not applicable	